

**WHAT IS CLAIMED IS:**

1 <sup>2A</sup> A process for bleaching pulp with ozone, which comprises the steps of:  
2 preparing a slurry of cellulosic pulp having a fiber consistency of from 1  
3 to less than 5 weight %;  
4 adding ozone to the cellulosic pulp in a contacting device to create a partial  
5 pressure [Pp] of O<sub>3</sub> greater than 1.4 psi and reacting the ozone with the pulp in  
6 said contacting device under high shear mixing conditions; and  
7 maintaining the ozone in contact with the pulp for a time sufficient to  
8 bleach the pulp.

1 2. The process of claim 1, wherein the partial pressure of ozone applied  
2 to the contacting device is sufficient to give at least 0.2 units lower Kappa number  
3 as compared to 1.4 psi partial pressure ozone conditions using the same ozone  
4 dosage.

1 3. The process of claim 1 for bleaching pulp with ozone wherein the  
2 bleached fibers are passed onto a chlorine dioxide bleaching stage.

1 4. The process of claim 1 for bleaching pulp, wherein the cellulosic pulp  
2 used to prepare the slurry is obtained from a chlorine dioxide bleaching stage.

1 5. The process of claim 1, wherein the contacting device is a high shear  
2 mixer which produces high shear by high rotational speeds across a narrow gap  
3 through which the pulp slurry flows.

4  
1 6. The process of claim 1 for bleaching pulp, wherein the ozone/cellulosic  
2 pulp is passed into a pressurized retention tube where the ozone reacts with the  
3 lignin in the cellulosic pulp.

5  
1 7. The process of claim 6 for bleaching pulp, wherein the ozone/cellulosic  
2 pulp from the retention tube leaves the retention tube through a pressure control  
3 valve and is discharged into a separate vessel, where the gas is separated and then  
4 passed into an ozone destruct unit before venting to the atmosphere, and the pulp  
5 slurry is pumped to a subsequent bleaching stage.

6  
1 8. The process of claim 1 for bleaching pulp, wherein the ozone used in  
2 the process is generated on-site from oxygen in a pressurized ozone generator.

9  
1 9. The process of claim 8, in which the ozone generator produces ozone  
2 from oxygen at a concentration of from 4 to 20%.

1 10. The process of claim 8, in which the ozone generator produces ozone  
2 from oxygen at a concentration of from 10 to 14%.

1 11. The process of claim 8, wherein the source of oxygen used for ozone  
2 generation is an on site air separation process.

1 12. The process of claim 11, wherein the air separation process is a  
2 vacuum swing absorption process.

1 13. The process of claim 8 for bleaching pulp with ozone, wherein the  
2 ozone gas mixture generated is compressed to a total pressure of from 20-200 psi.

1 14. The process of claim 8, wherein the ozone gas mixture generated is  
2 compressed to a total pressure of from 80 to 150 psi.

1 15. The process of claim 1, wherein the partial pressure of ozone created  
2 in the contacting device ranges from greater than 1.4 psi up to 43 psi.

1 16. The process of claim 1, wherein the partial pressure of ozone created  
2 in the contacting device ranges from 9.5 psi to 23 psi.

1 17. The process of claim 1 for bleaching pulp, wherein the pulp slurry  
2 consistency is in the range of from 2 to 4 weight %.

1 18. The process of claim 1 for bleaching pulp, wherein the ozone is  
2 mixed with the cellulosic fibers in the contacting device for a period of time  
3 ranging from 0.01 second to 1 minute.

1 19. The process of claim 1, wherein the ozone is mixed with the  
2 cellulosic fibers in the contacting device for a period of time ranging from 0.04  
3 second to 1 second.

1 20. The process of claim 4 for bleaching pulp, wherein the residence time  
2 in the retention tube ranges from 1 to 10 minutes.

1 21. The process of claim 1 for bleaching pulp, wherein temperature of the  
2 pulp slurry entering the mixing with ozone is in the range of from 20 to 80°C.

$z^0$ 

1           24. The process of claim 5, wherein the high shear mixer is connected to  
2           an ozone compressor such that the ozone delivered to the high shear mixer  
3           contacting device has been first compressed.

20

$$\begin{array}{ccccccc} \left\{ \begin{smallmatrix} 1 \\ 0 \end{smallmatrix} \right\} & \left\{ \begin{smallmatrix} 1 \\ 1 \end{smallmatrix} \right\} & \left\{ \begin{smallmatrix} 1 \\ 2 \end{smallmatrix} \right\} & \left\{ \begin{smallmatrix} 1 \\ 3 \end{smallmatrix} \right\} & \left\{ \begin{smallmatrix} 1 \\ 4 \end{smallmatrix} \right\} & \left\{ \begin{smallmatrix} 1 \\ 5 \end{smallmatrix} \right\} & \left\{ \begin{smallmatrix} 1 \\ 6 \end{smallmatrix} \right\} \\ \text{first} & \text{second} & \text{third} & \text{fourth} & \text{fifth} & \text{sixth} & \text{seventh} \end{array}$$

odd  
A2